

Larval Morphology, Behavior and Distribution — useful tools in the separation of two closely related *Nectopsyche* Caddis Flies

(Trichoptera : Leptoceridae)

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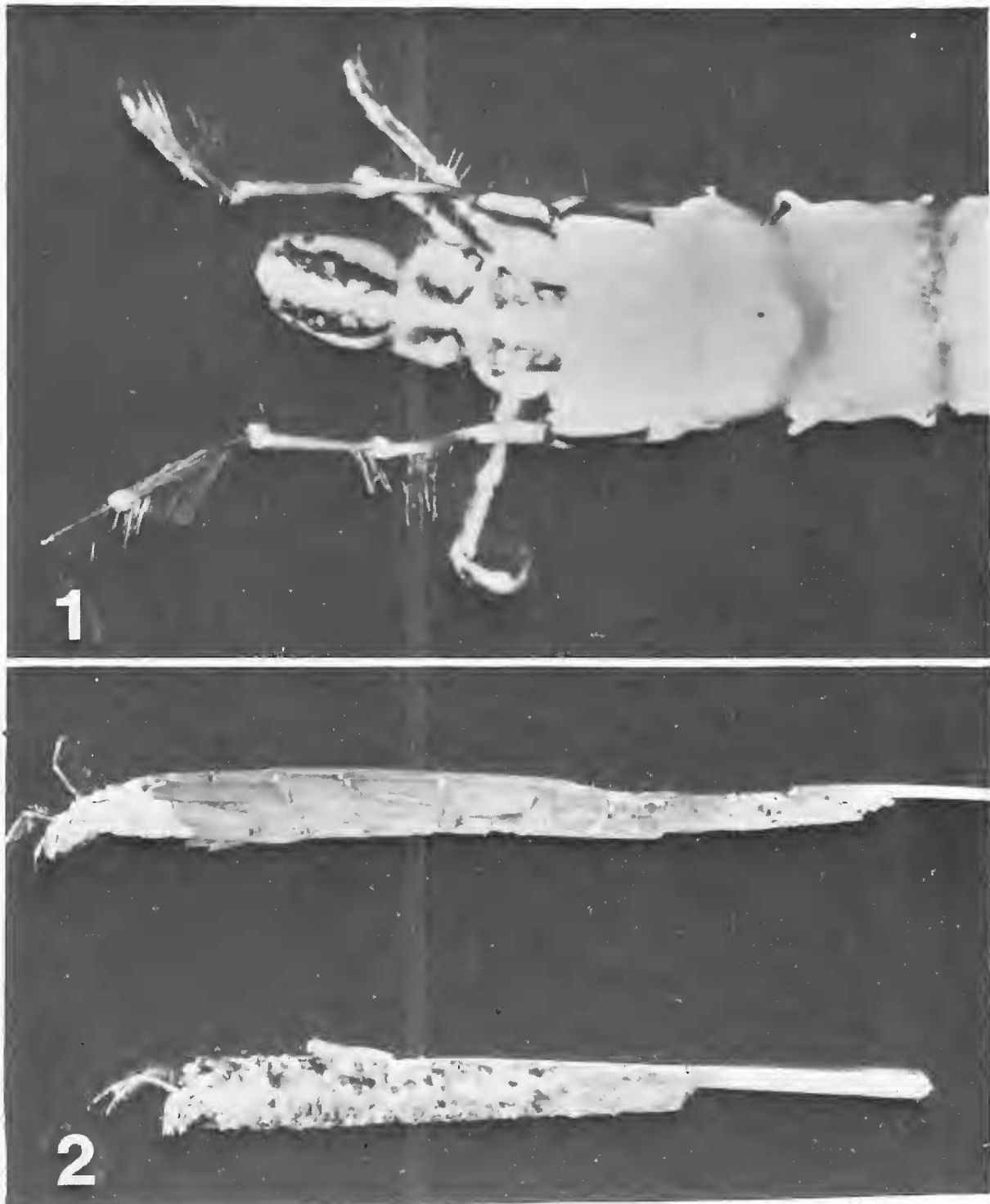
The genus *Nectopsyche*, Muller 1879, recently known as (*Lep-tocella*, Flint, 1974) is presently represented on the north american continent by twelve species (Haddock, in press). The majority are lowland inhabiting species having a broad, transcontinental distribution as in *Mystacides* (Yamamoto and Wiggins, 1964) and related genera. Ross (1944) has discussed the eastern members of *Nectopsyche* occurring in Illinois. A clear delineation of species limits had not been previously understood because of the lack of diagnostic information provided by adult genitalia and the paucity of larval material and pinned adults — particularly from the western U.S.

Adults of the genus *Nectopsyche* are easily recognized in the field because of the narrow, elongate, conspicuously patterned wings that are characteristic of most species. The antennae in the males are longer than the body length. Two frequently confused species, as evidenced by misidentified museum material are *Nectopsyche diarina* (Ross) and *Nectopsyche albida* (Walker) due to the very close similiarity in adult structures including wing color patterns, genitalia and the fact that they are sympatric over much of their range in the midwestern United States. In this paper easily identifiable characters present in the larvae and larval cases are given, Table 1, which readily identifies these two easily confused species. Complete taxonomic treatment of the 12 species in the genus is in press.

Larvae of *Nectopsyche diarina* can be identified by the presence of two dorsal, longitudinal, black stripes on the head, pronotum and mesonotum and the presence of tracheal gills on the abdomen (Fig. 1). *Nectopsyche diarina* has a metathoracic swimming brush consisting of many setae located on the lateral and ventral margins of the femur and tibia which is used in locomotion. Larval case design is highly variable and consists of sand with plant fragments arranged either in a spiralling or non-spiralling whorl (Fig. 2). It is interesting that the spiral case is similar to that of some species in the related genus *Triaenodes* (Hickin, 1967, and others).

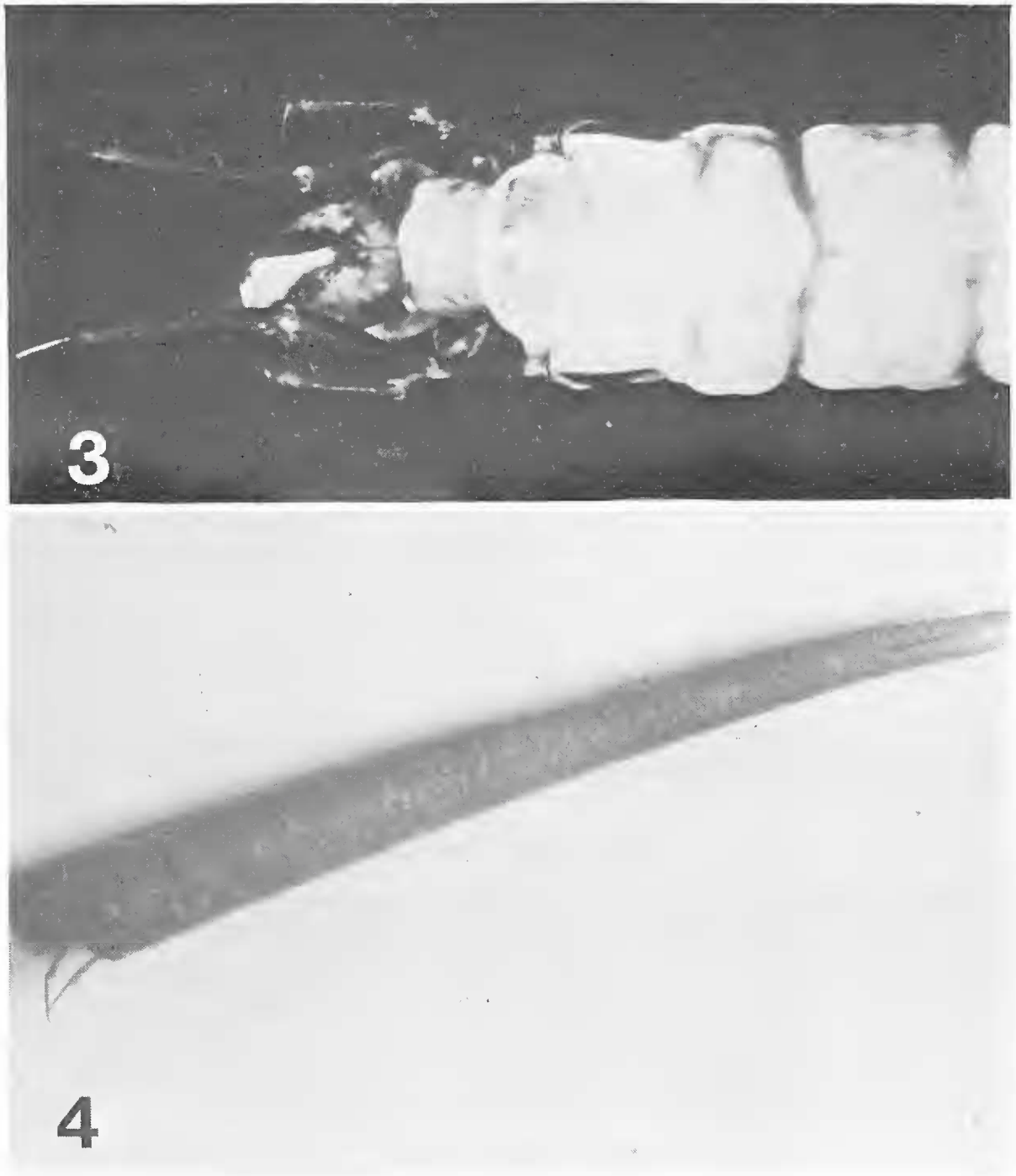
Nectopsyche albida larvae have two dorsal, longitudinal black stripes on the head only and do not possess abdominal tracheal gills (Fig. 3). Larvae are non-swimmers due to an absence of a metathoracic swimming brush. Larval cases are composed of sand grains and are therefore non-buoyant (Fig. 4).

Nectopsyche diarina occurs in lentic and lotic habitats east and west of the Rocky Mountains in the northern United States and



Figs. 1&2; *Nectopsyche diarina*. Fig. 1, mature larva, dorsal view, X8. Fig. 2, larval cases, X6.

Canada. Many records occur from the Snake and Missouri river drainages. The headwaters of both systems are within a short distance of the borders of Idaho, Montana and Wyoming. Miller (1958) has shown that a "well established" two-way faunal exchange has occurred between the headwaters of the two systems among certain primary freshwater fishes such as the mountain white fish, longnose dace and mottled sculpin.



Figs. 3&4; *Nectopsyche albida*. Fig. 3, mature larva, dorsal view, X8. Fig. 4, larval case, X7.

Nectopsyche albida is almost entirely confined to lentic habitats and has been collected only east of the rocky Mountains. The southern extreme of this cold-water species occurs in central Missouri along the Missouri river, which is congruent with the roughly east-west line that marks the maximum advance of the glaciers during the Pleistocene. I believe that following the Wisconsin glaciation, *N albida* dispersed northward into north central United States and southern Canada. The effect of glaciation on drainage reversals such as that suggested for the northward flow of the Upper

Table 1. Comparative Diagnostic Chart of *Nectopsyche diarina* and *Nectopsyche albida*.

	<i>N. diarina</i>	<i>N. albida</i>
Larval Morphology		
dorsal color patterns	black stripes on head and thorax	black stripes on head only
swimming brush on metathoracic legs	present	absent
Larval Behavior		
short-term swimming ability	yes	no
case design and materials	sand grains and plant fragments, arranged in spiral whorl or not	sand grains only
Distribution		
habitat	lentic and lotic	primarily lentic
dispersion	east and west of Rocky Mountains	east of Rockies only

Missouri River (Thornbury, 1954) may also explain the distribution of both *N. albida* and *N. diarina* throughout central Canada today.

Acknowledgements

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SCIENTIFIC NOTE

Notes on the 1973 Migration of *Vanessa cardui* (Lepidoptera: Nymphalidae). Notes on the 1973 Migration of *Vanessa cardui* (Lepidoptera: Nymphalidae). — Spring 1973 produced an extensive northward migration of this butterfly through southern California and Nevada.

On 26 days, from March through May, the directions of flight of 5,361 individuals were recorded at Big Pine, Inyo County, California. At times, three or four directions were simultaneously involved with little or no activity between. The insects' preferred direction of flight appeared to rotate nearly 135 degrees clockwise from west to north-northeast in ten weeks. This trend is illustrated in the percentages that flew within 45 degrees of these two directions during six time-periods:

	Mar. 18	Mar. 30	Apr. 8	Apr. 23	May 6	May 19
	to	to	to	to	to	to
	Mar. 23	Apr. 4	Apr. 12	May 1	May 11	Jun. 2
W	89	51	39	6	9	6
NNE	0	4	40	53	66	78

No southward movement could be observed in summer or fall. Williams (1970, J. Lepidop. Soc., 24:165) states that southward migration is most often reported in the more easterly states. An increasingly eastward flight vector during late spring may carry large numbers away from the far west before southerly flight begins.

Occasional migrators were observed in Inyo County as early as February. The number crossing a 50-foot line reached a peak of over 50 per minute at Big Pine by mid-April; 30 per minute continued through 2 June beyond which they drifted unidirectionally. Migratory flights persisted longer at elevations above 2500 m.

Numbers decreased as cooler temperatures were encountered; winds alone did not prevent flight. On 25 April, near Lida, Esmeralda County, Nevada, they flew northward against near-gale winds. Apparently having difficulty topping an east-west ridge they were funneled through a low pass and fanned out over the road within a foot of the surface at a groundspeed of less than 1 mile per hour. Counts across 10-foot lines showed that about 3 million per hour were crossing a mile's length of road.

The insects were observed settling to the desert floor and low shrubs before nightfall. On 20 May, in Huntoon Valley, Mineral County, Nevada, I happened near dusk, to be driving northeastward, the preferred direction of flight that day. Those within 50 feet rose into the air and flew alongside. When I drove at their flight speed, about 15 miles per hour, a cloud of butterflies formed on either side which soon became too dense to see through. They settled back to earth when the car speeded ahead or turned away from their flight direction.

Large migrations seem to occur every 4 to 7 years. The previous mass movement was in 1968. Spring 1977 produced only very small numbers. The next heavy flight is likely to occur in 1978 or 1979 and it is hoped that many persons will prepare themselves to accurately record numbers and flight directions. Such counts are needed from many locations and dates before the insects' behavior can be properly interpreted. — DERHAM GIULIANI, 170 Flower Alley, Big Pine, California 93513.